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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/530,553	07/21/2000	GERALD DEBOY	POO0578	6916

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EXAMINER	
BROCK II, PAUL E	
ART UNIT	PAPER NUMBER
2815	

DATE MAILED: 01/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/530,553	DEBOY ET AL.	
	Examiner	Art Unit	
	Paul E Brock II	2815	AW

-- Th MAILING DATE of this communication appears on the cov r sheet with the corr spond nce address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 November 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *16 and 20-56* is/are pending in the application.

4a) Of the above claim(s) *39-44 and 49-56* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *16,20-38 and 45-48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 December 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *28*.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Newly submitted claims 39 – 44 and 49 – 56 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons:

Applicant elected with traverse species II, drawn to a species disclosed in figure 5b, in paper number 11. Claims 39 – 44 and 49 – 56 are drawn to non-elected species.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 39 – 44 and 49 – 56 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Drawings

2. The corrected or substitute drawings were received on December 2, 2002. These drawings are approved.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 33 and 45 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. It is not clear where in the originally filed specification support for "said plurality of floating guard rings being lightly doped" and "said plurality of inter-ring zones being lightly doped" can be found.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

6. Claim 31 is rejected under 35 U.S.C. 102(e) as being anticipated by Shinohe et al. (USPAT 5969400, Shinohe).

With regard to claim 31, Shinohe discloses in figure 12 a semiconductor chip. Shinohe discloses in figure 12 a substrate having a major surface. Shinohe discloses in figure 12 a field of high voltage semiconductor components (42, 45, 54, etc.) defining a high voltage portion in the substrate. Shinohe discloses in figure 12 an edge structure at an edge of the high voltage portion, the edge structure separating the high voltage portion of the substrate from an edge of the major surface of the substrate. Shinohe discloses in figure 12 at least one inner-zone of a first conductivity type defining a ring structure around the field of high voltage semiconductor components at the major surface. Shinohe discloses in figure 12 at least one floating guard ring of a second conductivity type arranged in the at least on inner zone. Shinohe discloses in figure 12 at least one inter-ring zone of the first conductivity type arranged in the at least one inner zone, the at least one inter-ring zone being adjacent to the at least one floating guard ring. Since the geometry shown in figure 12 of Shinohe is the same as at least one of the geometries disclosed in the current application, it follows that Shinohe discloses in figure 12 at least one of the inter-ring zone and the floating guard ring being of at least on of a conductivity and a geometry such that their free charge carriers are totally depleted when a blocking voltage is applied, the at least one inter-ring zone and the at least one floating guard ring inherently having a net doping level over a whole surface area of the major surface of the at least one inner zone.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 16, 20 – 23, 25 – 20, 32 – 38, and 45 – 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shinohe in view of Hshieh et al. (USPAT 5930630, Hshieh).

With regard to claim 16, Shinohe discloses in figure 12 a high voltage semiconductor component. Shinohe discloses in figure 12 a semiconductor body having a high voltage region and having an edge region of the high voltage region, a high voltage resistant structure at the edge region having at least one inner zone (portion between 47 and D, not 52) of a first conductivity type adjacent to a first surface of said semiconductor body. Shinohe discloses in figure 12 a cell field (portion under 49) including high voltage components in the high voltage region. Shinohe is silent to teaching that high voltage individual components are connected in parallel. Hshieh teaches in figures 5f a cell field (portion under S) including individual high voltage components (125) in a high voltage region, the high voltage individual components being connected in parallel (S) and arranged in individual cells. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the individual high voltage components of Hshieh in the device of Shinohe in order to improve device ruggedness as stated by Hshieh in column 3, lines 58 – 64. Shinohe discloses in figure 12 at least one floating guard ring (52) of a second conductivity type arranged in said inner zone, said at least one floating guard ring surrounding the cell field. Shinohe discloses in figure 12 at least one inter-ring zone (between 52's) of said first conductivity type respectively arranged in said inner zone, said at least one inter-ring zone being arranged adjacent the at least one floating guard ring. Since the geometry shown in figure 12 of Shinohe is the same as at least one of the geometries disclosed in

the current application, it follows that Shinohe discloses in figure 12 the at least one floating guard ring and said at least one inter-ring zone have at least one of conductivities and geometries set such that their free charge carriers are totally depleted when a blocking voltage is applied. Shinohe inherently discloses in figure 12 that the at least one floating guard ring and the at least one inter-ring zone having respective doping levels such that a net doping level over a whole surface area of the edge region is approximately equal to zero.

With regard to claim 20, Shinohe discloses in figure 12 wherein said at least one floating guard ring has a U-shaped cross section.

With regard to claim 21, Shinohe discloses in figure 12 at least one space charge zone stopper (51) located at an outermost edge of said edge region of said semiconductor component.

With regard to claim 22, Shinohe discloses in figure 12 wherein said space charge zone stopper comprises a heavily doped region (47) of said first conductivity type, said heavily doped region being arranged in said inner zone.

With regard to claim 23, Shinohe discloses in figure 12 wherein said space charge zone stopper comprises a damage implanted region (47) being arranged in said inner zone.

With regard to claim 25, Shinohe does not disclose a magnetoresistor. Hshieh teaches in figure 5f at least one magnetoresistor (125) located at an inner edge of an edge region of said semiconductor component. It would have been further obvious to one of ordinary skill in the art at the time of the present invention to use the magnetoresistor of Shinohe in order to improve device performance as taught by Hshieh in the paragraph linking columns 1 and 2.

With regard to claim 26, Hshieh teaches in figure 5f wherein at least one of said magnetoresistors is simultaneously a gate electrode of said semiconductor component.

With regard to claim 27, Hshieh teaches in figure 5f wherein at least an outermost of the magnetoresistors is nearly completely enclosed by a cathode metallization (170) in a direction of the first surface of the semiconductor component.

With regard to claim 28, Hshieh teaches in figure 5f wherein said cathode metallization is a metallization of a source electrode of said semiconductor component.

With regard to claim 29, Shinohe discloses in figure 12 wherein said inter-ring zones in said edge region have a cross-section tapered to said first surface.

With regard to claim 30, Hshieh teaches in figure 5f wherein the individual high voltage components are vertical power transistors.

With regard to claim 32, Shinohe discloses in figure 12 a semiconductor chip. Shinohe discloses in figure 12 a substrate having a major surface. Shinohe discloses in figure 12 a plurality of high voltage semiconductor components in the substrate. Shinohe is silent to teaching that high voltage semiconductor components are high voltage vertical MOSFET components. Hshieh teaches in figures 5f a plurality of high voltage vertical MOSFET components in the substrate. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the high voltage vertical MOSFET components of Hshieh in the device of Shinohe in order to improve device ruggedness as stated by Hshieh in column 3, lines 58 – 64. Shinohe discloses in figure 12 an edge structure at an edge of the plurality of high voltage semiconductor components to separate the high voltage semiconductor components from a remainder of the substrate. Shinohe discloses in figure 12 at least one inner zone of a first conductivity type defining a ring structure around the plurality of high voltage semiconductor components at the major surface. Shinohe discloses in figure 12 at least one floating guard ring

of a second conductivity type arranged in the at least on inner zone. Shinohe discloses in figure 12 an inter-ring zone of the first conductivity type arranged in the at least one inner zone, the inter-ring zone being allocated to the at least one floating guard ring. Since the geometry shown in figure 12 of Shinohe is the same as at least one of the geometries disclosed in the current application, it follows that Shinohe discloses in figure 12 at least one of the inter-ring zone and the floating guard ring being of at least on of a conductivity and a geometry such that their free charge carriers are totally depleted when a blocking voltage is applied. Shinohe inherently discloses in figure 12 that the at least one floating guard ring and the at least one inter-ring zone having respective doping levels such that a net doping level over a whole surface area of the edge region is approximately equal to zero.

With regard to claims 33 and 45, Shinohe discloses in figure 12 wherein the at least one floating guard ring is a plurality of floating guard rings. Shinohe discloses in figure 12 the at least one inter-ring zone is a plurality of inter ring zones disposed between respective ones of the plurality of floating guard rings. As far as the examiner can ascertain, Shinohe discloses in figure 12 said plurality of floating guard rings being lightly doped at the second conductivity type. As far as the examiner can ascertain, Shinohe discloses in figure 12 the plurality of inter-ring zones being lightly doped at the first conductivity type.

With regard to claims 34 and 46, Shinohe discloses in figure 12 wherein the at least one floating guard ring is a plurality of floating guard rings. Shinohe discloses in figure 12 the at least one inter-ring zone is a plurality of inter ring zones disposed between respective ones of the plurality of floating guard rings. Shinohe discloses in figure 12 said plurality of floating guard rings being doped at the second conductivity type. As far as the examiner can ascertain, Shinohe

discloses in figure 12 the plurality of inter-ring zones being heavily doped at the first conductivity type (heavily doped compared to an undoped substrate).

With regard to claims 35 and 47, Shinohe discloses in figure 12 the floating guard ring is doped at a second conductivity type and the inter ring zones are of the first conductivity type. It is obvious to consider the floating guard ring as not having a definite boundary between the dopants of the floating guard ring and the inter-ring zones. It can therefore be considered that the floating guard ring comprises at least one layer of the second conductivity type between the highest second conductivity concentration of the floating guard ring and the highest concentration of the first conductivity type of the inter-ring zone. One of ordinary skill in the art at the time of the present invention would obviously interpret this layer doped at the second conductivity type between respective ones of the floating guard rings and the inter-ring zones because the physical geometry of any diffusion layer would have these concentration varying properties.

With regard to claims 36 and 48, similar to the analysis of claim 35, above, but now considering the respective "second" layer of claim 36 is equivalent to the "first" layer of claim 35. A first layer of a first conductivity type would be present as varying concentrations of dopants from the "boundary" between the maximum concentration of a first conductivity type in the inter-ring zones is decreased in a direction of towards the maximum concentration of the second conductivity type in the floating guard rings. Therefore, it is further obvious to consider this additional "first" layer of first conductivity type as a physical property of the device in Shinohe.

With regard to claim 37, Shinohe discloses in figure 12 wherein the at least one floating guard ring is a plurality of floating guard rings. Shinohe discloses in figure 12 the at least one inter-ring zone is a plurality of inter ring zones disposed between respective ones of the plurality of floating guard rings. Shinohe discloses in figure 12 the plurality of floating guard rings extending into the inner zone of the semiconductor body in substantially parallel columnar cross sections disposed at a regular spacing from one another. While the cross section of the floating guard rings in figure 12 of Shinohe are not exactly parallel, they do read on being substantially parallel.

With regard to claim 38, Shinohe discloses in figure 12 wherein the plurality of floating guard rings extend to mutually different depths into the semiconductor body.

9. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shinohe and Hshieh as applied to claims 16 and 21 above, and further in view of Hsu et al. (USPAT 5521105, Hsu).

With regard to claim 24, Shinohe discloses in figure 12 wherein said space charge zone stopper comprises an electrode (51) connected to said inner zone. Hsu is silent to an electrode material. Hsu discloses that an electrode (23) can be polysilicon. It would have been obvious to use the polysilicon of Hsu in the device of Shinohe in order to use an electrode material that is well known and widely available in the art, as well as economically feasible.

Response to Arguments

10. Applicant's arguments filed November 13, 2003 have been fully considered but they are not persuasive.

11. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the volume effect) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Therefore, applicants arguments are not persuasive, and the rejection is proper.

12. In response to applicant's argument that the "doping concentrations of these n-regions and p-regions are designed in such a way as that the blocking condition of the whole layer is totally depleted", a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). In this case, a "blocking condition" is only obtained while the device is in use. Therefore, applicant's arguments are not persuasive, and the rejection is proper.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul E Brock II whose telephone number is (703) 308-6236. The examiner can normally be reached on 8:30 AM - 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

Paul E Brock II
January 23, 2004

Tom Thomas
Supervisory Patent Examiner
Art Unit 2815